IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of	Atty. Docket: MDPCT0330US
RUDOLF H. BRZESOWSKY ET AL.	CONF. NO.: 5592
Serial No.: 10/524,982	Examiner: MARIA A. ELVE
Filed: FEBRUARY 18, 2005	Group Art Unit: 3742

TITLE: METHOD OF BREAKING A BRITTLE SUBSTRATE

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Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

APPEAL BRIEF

Sir:

Appellants herewith respectfully present its Brief on Appeal as follows:

REAL PARTY IN INTEREST

The real party in interest is Mitsuboshi Diamond Industrial Co., LTD., a corporation of Japan having an office and a place of business at 2-12-12 Minami-Kaneden, Suita-city, Osaka, 564-0044, Japan.

RELATED APPEALS AND INTERFERENCES

To the best of Appellants' knowledge and belief, there are no related appeals or interferences.

STATUS OF CLAIMS

Claims 1-20 are pending in this application. Claims 1-20 are rejected in the Final Office Action that issued September 1, 2009. No Amendment After Final Action was submitted. During a telephonic conference call on October 20, 2009 between Examiner Elve and Gregory L. Thorne, attorney for the Applicants, Examiner Elve indicated that claim 12 may be allowable over the cited prior art although no further Office Action was issued indicating the allowability of claim 12. Claims 1-20 are the subject of this appeal.

STATUS OF AMENDMENTS

An amendment was submitted on June 4, 2009 in response to an Office Action of March 4, 2009. No Amendment After Final Action was filed in response to the Final Office Action that issued September 1, 2009. This Appeal Brief is in response to the Final Office Action that rejected claims 1-20.

SUMMARY OF CLAIMED SUBJECT MATTER

The present invention, for example as claimed in claim 1, relates to a method of breaking a substrate of brittle material (e.g., see, present application, FIG. 1, abstract, page 1, lines 1-2, and page 2, lines 24-26). The method includes providing a substrate of a brittle material (e.g., see, present application, glass, crystalline silica, ceramics and compositions thereof, page 2, lines 24-26), focusing a laser beam on an exposed surface of the substrate to heat the exposed surface of the substrate with the laser beam to create a heated spot on the exposed surface of the substrate (e.g., see, present application, spot 3, abstract, page 2, lines 25-26), moving the laser beam and the substrate with respect to each other to create a line of heated spots on the exposed surface of the substrate (e.g., see, present application, page 2, lines 31-33), cooling the heated spots on the substrate by locally applying a cooling medium such that a micro-crack in the line of heated spots is propagated on the exposed surface of the substrate (e.g., see, present application, page 2, lines 27-30 and lines 33-34), and breaking the substrate along the line of the propagated micro-crack by applying a force on the substrate (e.g.,

see, present application, page 3, lines 1-2) wherein the cooling medium comprises an aqueous surfactant solution (e.g., see, present application, FIG. 2, abstract and page 3, lines 19-30).

The present invention, for example as claimed in claim 11, relates to a method of breaking a substrate of brittle material (e.g., see, present application, FIG. 1, abstract, page 1, lines 1-2, and page 2, lines 24-26). The method includes providing a substrate of a brittle material (e.g., see, present application, glass, crystalline silica, ceramics and compositions thereof, page 2, lines 24-26), focusing a laser beam on an exposed surface of the substrate to heat the exposed surface of the substrate with the laser beam to create a heated spot on the exposed surface of the substrate (e.g., see, present application, spot 3, abstract, page 2, lines 25-26), moving the laser beam and the substrate with respect to each other to create a line of heated spots on the exposed surface of the substrate (e.g., see, present application, page 2, lines 31-33), cooling the heated spots on the substrate by locally applying an aqueous surfactant solution such that a micro-crack in the line of heated spots is propagated on the exposed surface of the substrate and the aqueous surfactant solution enters the micro-crack (e.g., see, present application, page 2, lines 27-

30, lines 33-34 and page 3, lines 27-28), and breaking the substrate along the line of the propagated micro-crack by applying a force on the substrate (e.g., see, present application, page 3, lines 1-2), wherein the aqueous surfactant solution enters the micro-crack prior to the breaking act (e.g., see, present application, page 2, lines 27-29 and page 3, lines 1-2).

The present invention, for example as claimed in claim 12, relates to the method of breaking a substrate of brittle material according to claim 11 including breaking a substrate of brittle material (e.g., see, present application, FIG. 1, abstract, page 1, lines 1-2, and page 2, lines 24-26). The method includes providing a substrate of a brittle material (e.g., see, present application, glass, crystalline silica, ceramics and compositions thereof, page 2, lines 24-26), focusing a laser beam on an exposed surface of the substrate to heat the exposed surface of the substrate with the laser beam to create a heated spot on the exposed surface of the substrate (e.g., see, present application, spot 3, abstract, page 2, lines 25-26), moving the laser beam and the substrate with respect to each other to create a line of heated spots on the exposed surface of the substrate (e.g., see, present application, page 2, lines 31-33), cooling the heated spots on the substrate by

locally applying an aqueous surfactant solution such that a micro-crack in the line of heated spots is propagated on the exposed surface of the substrate and the aqueous surfactant solution enters the micro-crack (e.g., see, present application, page 2, lines 27-30, lines 33-34 and page 3, lines 27-28), and breaking the substrate along the line of the propagated micro-crack by applying a force on the substrate (e.g., see, present application, page 3, lines 1-2), wherein the aqueous surfactant solution enters the micro-crack prior to the breaking act (e.g., see, present application, page 2, lines 27-29 and page 3, lines 1-2), wherein the aqueous surfactant solution is selected to bond to broken siloxane bonds in the micro-crack (e.g., see, present application, page 3, lines 27-28).

It should be explicitly noted that it is not the Appellants' intention that the currently claimed device and method be limited to operation within the illustrative device and method described above beyond what is required by the claim language. Further description of the illustrative device and method is provided above indicating portions of the claims which cover the illustrative device and method merely for compliance with requirements of this

appeal without intending any further interpreted limitations be read into the claims as presented.

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Whether the Office Actions issued on March 4, 2009 and September 1, 2009 meet the requirements of MPEP §707.07(f) by addressing the arguments submitted by the Applicants/Appellants in response to the Office Actions.

Whether claims 1-4, 6, 8, 10-11, 13-15, 17 and 19 of U.S. Patent Application Serial No. 10/524,982 are obvious under 35 U.S.C. §103(a) over U.S. Patent No. 6,211,488 to Hoekstra ("Hoekstra") in view of U.S. Patent No. 6,673,752 to Bookbinder ("Bookbinder").

Whether claim 12 of U.S. Patent Application Serial No. 10/524,982 is obvious under 35 U.S.C. §103(a) over Hoekstra and Bookbinder in view of U.S. Patent No. 7,253,017 to Roscheisen ("Roscheisen").

Whether claims 5, 7, 9, 16, 18 and 20 of U.S. Patent Application Serial No. 10/524,982 are obvious under 35 U.S.C. §103(a) over Hoekstra and Bookbinder in view of U.S. Patent No. 5,565,363 to Iwata ("Iwata").

ARGUMENT

The Office Actions issued on March 4, 2009 and September 1, 2009 fail to meet the requirements of MPEP §707.07(f) by failing to address the arguments submitted by the Appellants in response to the Office Actions.

In the Amendment Submitted On December 8, 2008 (hereinafter, "Amendment 1"), the Appellants (at the time of Amendment 1, Applicants) addressed the rejection of claims 1-20 under 35 U.S.C. §103(a) in detail extending over pages 11-27 of Amendment 1, yet the Office Action dated March 4, 2009, merely reiterates the prior rejection, word for word, from the August 6, 2008 Final Office Action, without even addressing points raised by the Prior Amendment regarding the rejection of claims 1-20 under 35 U.S.C. §103 including claim recitations added by Amendment 1. In fact, the Response to Arguments section of the Office Action of March 4, 2009, and all of the Office Action for that matter is completely silent regarding the points raised by the Appellants in Amendment 1, other than to add a rejection of claim 12 under 35 U.S.C. §112, first paragraph.

The MPEP in §707.07(f) makes clear that (emphasis added) "[i]n order to provide a complete application file history and to enhance the clarity of the prosecution history record, an examiner must provide clear explanations of all actions taken by the examiner during prosecution of an application." The MPEP further provides that (emphasis added) "[w]here the applicant traverses any rejection, the examiner should, if he or she repeats the rejection, take note of the applicant's argument and answer the substance of it."

Yet, in Amendment 1, the rejection of claims 1-20 under 35 U.S.C. §103(a), is traversed starting on page 11 of Amendment 1, yet the Office Action of March 4, 2009 fails completely to address the points raised in Amendment 1.

In the MPEP in §707.07(f), the Examiner Note 1 states that (emphasis added) "[t]he examiner must address all arguments which have not already been responded to in the statement of the rejection."

Further, the claims as presented in Amendment 1 where amended in Amendment 1, yet the Office Action of March 4, 2009 fails to address the then newly presented claim language in any form. As indicated above, the rejection of claims 1-20 under 35 U.S.C.

§103(a) in the Office Action of March 4, 2009 is word-for-word the same rejection provided in an Office Action of October 15, 2008, prior to the amended claim language that was provided by Amendment 1.

Yet, MPEP in §707.07(f) makes clear that "[i]f a rejection of record is to be applied to a new or amended claim, specific identification of that ground of rejection, as by citation of the paragraph in the former Office letter in which the rejection was originally stated, should be given", however, it is respectfully submitted that the Office Action of March 4, 2009 does not provide any such recitation.

This deficiency of the Office Action of March 4, 2009 was pointed out in Amendment 2, submitted on June 4, 2009 in response to the Office Action of March 4, 2009, yet, inexplicably, the substance of the rejection contained in a subsequent Final Office Action of September 1, 2009, pages 2-8, again contained the exact word-for-word rejection without any reference to the claim recitations that were added by Amendment 1, prior to both of the Office Action of March 4, 2009 and the Final Office Action of September 1, 2009.

Accordingly, since the Office Action of March 4, 2009 and the Final Office Action of September 1, 2009 have both failed to address the claim recitations and points raised in Amendment 1 and Amendment 2 including an amendment to the claims presented in the Amendment 1, it is respectfully submitted that the rejection of claims 1-20 under 35 U.S.C. §103(a) should be reversed.

Claims 1-4, 6, 8, 10-11, 13-15, 17 and 19 are said to be obvious over Hoekstra in view of Bookbinder.

Appellants respectfully request the Board to address the patentability of independent claims 1 and 11, and further claims 2-4, 6, 8, 10, 13-15, 17 and 19 as respectively depending from one of independent claims 1 and 11, based on the requirements of independent claims 1 and 11. This position is provided for the specific and stated purpose of simplifying the current issues on appeal. However, Appellants herein specifically reserve the right to argue and address the separate patentability of claims 2-4, 6, 8, 10, 13-15, 17 and 19 at a later date should the separately patentable subject matter of claims 2-4, 6, 8, 10, 13-15, 17 and 19 later become an issue. Accordingly, this limitation of the subject matter presented for appeal herein, specifically limited to discussions of the patentability of independent claims 1 and 11 and dependent claim 12 is not intended as a waiver of Appellants' right to argue the patentability of the further claims and claim elements at that later time.

Hoekstra shows an apparatus that utilizes a laser and a cooling stream together with breaking beams to break a substrate. Hoekstra provides (emphasis added) "[a]n apparatus and method for physically separating non-metallic substrates [that] forms a microcrack in the substrate and controllingly propagates the microcrack." Hoekstra makes explicitly clear that the (emphasis added) "[a]n initial mechanical or pulsed laser scribing device forms a microcrack in the substrate. If a pulsed laser is used, it forms a crack inside the substrate that does not extend to either the upper or lower surface." (See, Hoekstra, abstract.)

Hoekstra further makes clear that (emphasis added) "the focal point 37 of the laser 34 may be vertically positioned within the substrate 4 as desired. In a preferred arrangement, the focal point of the pulsed laser is within the thickness of the substrate 4, slightly below the upper face of the substrate 4. For example, for a glass sheet having a thickness of approximately 1 mm, the focal point should be 5-50% or 0.05-0.50 mm, from the upper surface, preferably about 0.1 mm. However, the preferred depth of the focal point may depend on the thickness of the substrate to be split." (See, Hoekstra, FIG. 4 and the accompanying description contained in Hoekstra, Col. 5, lines 49-61.) As shown in FIG. 4 of Hoekstra,

"[t]he pulsed laser 34 through the lens 35 creates a void 37 in the substrate from the edge of the substrate 4 inward at a certain distance below the upper face of the substrate 4." (See, Hoekstra, Col. 5, lines 62-64.)

Clearly Hoekstra teaches a laser that is focused within the substrate below a surface of the substrate.

In addition, Hoekstra further makes clear that it is only when the substrate is introduced to the break beams 44, 46 wherein (emphasis added) "the break beams 46 and 48 heat the regions on both sides of the microcrack to create tensile forces to that are sufficient to separate the substrate 4 along the separation line 45 from the microcrack to the bottom surface." (see, Hoekstra, Col. 6, lines 45-49.) It is respectfully submitted that Hoekstra unequivocal language makes clear that the microcrack, prior to introduction to the break beams 44, 46, does not extend to the surface of the substrate.

In fact, it is respectfully submitted that Hoekstra teaches away from propagating a crack on the exposed surface of the substrate.

Hoekstra teaches that the benefit of crack formation below a surface of the substrate is that (emphasis added) "the laser scribe

initiation device 24 eliminates inherent drawbacks of a mechanical scribe initiation system. For example, the use of the laser scribe initiation device 24 eliminates any particulate material that may be generated by mechanically forming the microcrack."

As should be clear to a person of ordinary skill in the art, forming the microcrack on the surface of the substrate, even with a laser, would have the same drawback of creating particulate matter as the previous scribing methods. Accordingly, as should be clear, Hoekstra teaches forming the crack below the surface of the substrate and teaches away from forming the crack on the surface of the substrate as recited in the claims.

While Bookbinder is also cited in rejecting claims 1-20, Bookbinder is only cited for showing a surfactant (see, Final Office Action, page 4) and as such, does nothing to cure the deficiencies of Hoekstra.

Additionally, it is respectfully submitted that the combination of Hoekstra with Bookbinder may only be gleamed from hindsight reconstruction and as such, there is no proper motivation to combine Hoekstra with Bookbinder.

It is respectfully submitted that Bookbinder relates to cutting fluids. Bookbinder's cutting fluids are typically used for

cutting by a saw blade (see, Bookbinder, abstract). Bookbinder's cutting fluids are used for cooling the saw blade heated by frictional heat of a workpiece (see, Bookbinder, Col. 2, lines 14-16). Bookbinder's cutting fluids help provide a slippery surface for the saw blade, but do not act on the workpiece. As shown in FIG. 1 of Bookbinder, the cutting fluid is applied to the cutting blade and not to the material being cut. The organic solution binds to chips that are cut away from the material being cut to keep the particles from clogging the abrading surface of the cutting blade (see, Col. 2, lines 51-61).

On the other hand, Hoekstra relates to laser scribing. Quenching fluids used by Hoekstra directly contribute to scribing a substrate. Namely, the substrate in Hoekstra is scribed by a temperature gap. As stated in Hoekstra, "[t]he temperature differential between the heat affected zone of the substrate and the coolant stream propagates the micro-crack." (See, Hoekstra, abstract.) The temperature gap arises from laser heating and "quenching by the quenching fluids".

It is respectfully submitted that the functions of a quenching fluid used for laser scribing are much different from those required for cutting fluids used for cutting work pieces by a saw

blade. Further, a person of ordinary skill in the art that is applying Hoekstra, would not look to Bookbinder which teaches use of a saw blade since, Hoekstra is directed to avoiding the problems caused by using a saw blade approach, yet, Bookbinder teaches such a saw blade approach.

Therefore, it is respectfully submitted that there is no motivation found in the prior art references for the man skilled in the art to use Bookbinder's cutting fluids in place of the quenching fluids for Hoekstra's laser scribing. In cutting work pieces, small particles are not generated by a laser beam unlike the case of a saw blade and accordingly, there would be no reason to apply the teaching of Bookbinders cutting fluid which is taught by Bookbinder to lubricate a cutting blade and wash away particulate. Therefore, there is no teaching contained within either of Hoekstra or Bookbinder of using surfactant for laser scribing.

It is respectfully submitted that the method of claim 1 is not anticipated or made obvious by the teachings of Hoekstra in view of Bookbinder. For example, Hoekstra in view of Bookbinder does not teach, disclose or suggest, a method that amongst other patentable elements, comprises (illustrative emphasis provided) "<u>focusing a</u>

laser beam on an exposed surface of the substrate to heat the exposed surface of the substrate with the laser beam to create a heated spot on the exposed surface of the substrate, moving the laser beam and the substrate with respect to each other to create a line of heated spots on the exposed surface of the substrate, cooling the heated spots on the substrate by locally applying a cooling medium such that a micro-crack in the line of heated spots is propagated on the exposed surface of the substrate, and breaking the substrate along the line of the propagated micro-crack by applying a force on the substrate wherein the cooling medium comprises an aqueous surfactant solution" as recited in claim 1, and as similarly recited in claim 11. Clearly in Hoekstra, the laser is focused in the substrate and the heated spot and crack is purposefully propagated in the substrate without extending to the outer or lower surface of the substrate.

Based on the foregoing, the Appellants respectfully submit that independent claims 1 and 11 are patentable over Hoekstra in view of Bookbinder and notice to this effect is earnestly solicited.

Additionally, claims 2-4, 6, 8, 10, 13-15, 17 and 19 respectively depend from one of claims 1 and 11 and accordingly are

allowable for at least this reason as well as for the separately patentable elements contained in each of said claims. Accordingly, separate consideration of each of the dependent claims is respectfully requested.

Claim 12 is said to be unpatentable over Hoekstra in view of Bookbinder in further view of Roscheisen.

Roscheisen is cited for allegedly showing elements of the dependent claim yet does not cure the deficiencies in each of Hoekstra and Bookbinder. Accordingly, it is respectfully submitted that claim 12 is allowable at least based on its dependence from independent claim 11.

Further, while Roscheisen does describe "surfactant templation [which] refers [to] an approach toward achieving pore size control of inorganic or organic frameworks, e.g., by using surfactants or block copolymers as templates to build a structured mineral network" (see, Roscheisen, Col. 6, lines 13-21), it is respectfully submitted that Roscheisen does not teach, disclose or suggest "the aqueous surfactant solution is selected to bond to broken siloxane bonds in the micro-crack" as recited in claim 12.

Based on the foregoing, the Appellants respectfully submit that claim 12 is patentable over Hoekstra in view of Bookbinder in further view of Roscheisen and notice to this effect is earnestly solicited.

Claims 5, 7, 9, 16, 18 and 20 are said to be unpatentable over Hoekstra in view of Bookbinder in further view of Iwata.

Iwata is cited for allegedly showing elements of the dependent claims yet does not cure the deficiencies in each of Hoekstra and Bookbinder. Accordingly, it is respectfully submitted that claims 5, 7, 9, 16, 18 and 20 are allowable at least based on respective dependency from one of independent claims 1 and 11.

In addition, Appellants deny any statement, position or averment of the Examiner that is not specifically addressed by the foregoing argument and response. Any rejections and/or points of argument not addressed would appear to be moot in view of the presented remarks. However, the Appellants reserve the right to submit further arguments in support of the above stated position, should that become necessary. No arguments are waived and none of the Examiner's statements are conceded.

CONCLUSION

Claims 1-20 are patentable over any of Hoekstra in view of Bookbinder alone and in any combination with Roscheisen and Iwata.

Thus the Examiner's rejection of claims 1-20 should be reversed.

Respectfully submitted,

By _____
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APPENDIX A

CLAIMS ON APPEAL

1. (Previously presented) A method of breaking a substrate of brittle material, the method comprising acts of:

providing a substrate of a brittle material,

focusing a laser beam on an exposed surface of the substrate to heat the exposed surface of the substrate with the laser beam to create a heated spot on the exposed surface of the substrate,

moving the laser beam and the substrate with respect to each other to create a line of heated spots on the exposed surface of the substrate,

cooling the heated spots on the substrate by locally applying a cooling medium such that a micro-crack in the line of heated spots is propagated on the exposed surface of the substrate, and

breaking the substrate along the line of the propagated micro-crack by applying a force on the substrate

wherein the cooling medium comprises an aqueous surfactant solution.

2. (Previously presented) The method of breaking a substrate of brittle material according to claim 1, wherein the cooling medium further comprises air mixed with the aqueous surfactant solution.

3. (Previously presented) The method of breaking a substrate of brittle material according to claim 1, wherein the concentration of the surfactant is in the range of 0.01 to 1% of weight.

4. (Previously presented) The method of breaking a substrate of brittle material according to claim 1, wherein the aqueous surfactant solution comprises a cationic surfactant.

5. (Previously presented) The method of breaking a substrate of brittle material according to claim 4, wherein the cationic surfactant comprises cetyl trimethyl ammonium bromide (CTAB).

6. (Previously presented) The method of breaking a substrate of brittle material according to claim 1, wherein the aqueous surfactant solution comprises a nonionic surfactant.

7. (Previously presented) The method of breaking a substrate of brittle material according to claim 6, wherein the nonionic surfactant comprises octadecyl deca(ethyleenoxide) hydroxide.

8. (Previously presented) The method of breaking a substrate of brittle material according to claim 1, wherein the aqueous surfactant solution comprises an anionic surfactant.

9. (Previously presented) The method of breaking a substrate of brittle material according to claim 8, wherein the anionic surfactant comprises dodecylbenzene sulfonic acid sodium salt.

10. (Previously presented) The method of breaking a substrate of brittle material according to claim 1, wherein the brittle material comprises one or more of glass, crystalline silica and ceramics.

11. (Previously presented) A method of breaking a substrate of brittle material, the method comprising acts of:

providing a substrate of a brittle material,

focusing a laser beam on an exposed surface of the substrate to heat the exposed surface of the substrate with the laser beam to create a heated spot on the exposed surface of the substrate,

moving the laser beam and the substrate with respect to each other to create a line of heated spots on the exposed surface of the substrate,

cooling the heated spots on the substrate by locally applying an aqueous surfactant solution such that a micro-crack in the line of heated spots is propagated on the exposed surface of the substrate and the aqueous surfactant solution enters the micro-crack, and

breaking the substrate along the line of the propagated micro-crack by applying a force on the substrate, wherein the aqueous surfactant solution enters the micro-crack prior to the breaking act.

12. (Previously presented) The method of breaking a substrate of brittle material according to claim 11, wherein the aqueous surfactant solution is selected to bond to broken siloxane bonds in the micro-crack.

13. (Previously presented) The method of breaking a substrate of brittle material according to claim 11, wherein the aqueous surfactant solution further comprises air mixed with the aqueous surfactant solution.

14. (Previously presented) The method of breaking a substrate of brittle material according to claim 11, wherein the concentration of the aqueous surfactant solution is in the range of 0.01 to 1% of weight.

15. (Previously presented) The method of breaking a substrate of brittle material according to claim 11, wherein the aqueous surfactant solution comprises a cationic surfactant.

16. (Previously presented) The method of breaking a substrate of brittle material according to claim 15, wherein the cationic surfactant comprises cetyl trimethyl ammonium bromide (CTAB).

17. (Previously presented) The method of breaking a substrate of brittle material according to claim 11, wherein the aqueous surfactant solution comprises a nonionic surfactant.

18. (Previously presented) The method of breaking a substrate of brittle material according to claim 17, wherein the nonionic surfactant comprises octadecyl deca(ethyleenoxide) hydroxide.

19. (Previously presented) The method of breaking a substrate of brittle material according to claim 11, wherein the aqueous surfactant solution comprises an anionic surfactant.

20. (Previously presented) The method of breaking a substrate of brittle material according to claim 19, wherein the anionic surfactant comprises dodecylbenzene sulfonic acid sodium salt.

APPENDIX B

Evidence on Appeal

None

APPENDIX C

Related Proceedings of Appeal

None